Result Page

The invention relates to an heat exchanger as well as a method to the production of a such heat exchanger.

Heat exchangers are apparatuses, the warm one of a medium with higher temperature on a medium with lower temperature transfered, whereby the warmer medium cools down, during itself the colder medium heated. In dependence of the application purpose different technical embodiments of heat exchangers are known.

For an effective heat exchange between the mediums a if possible large exchangeflat is required. For this purpose heat exchangers exhibit heat sinks with rib tread and tape windings or lamella-occupied tubes. The contactless contact between a such heat sink and a medium becomes over tubes or similar manufactured, which are mechanical connected with the heat sink. Such connections, which became manufactured by presses, sticking or joints, to have the disadvantage that air gaps form barriers for the heat flow and the mechanical maximum stress are small. Besides the contact surface for the heat exchange between heat sinks and tube is small.

The improvement of the heat exchange 101 23 456,2 becomes an heat exchanger proposed in DE, which consists of open-porous metal foam, whose cells are connected in such a manner with one another that a fluid medium can flow by the metal foam through. To the open-porous metal foam a structural element is material-conclusively cast-on. The structural element can be as plate formed, whereby the plate does not exhibit pores, but when full material formed is.

The invention is the basis the object to suggest an improved heat exchanger. In particular an heat exchanger indicated is to become, an improved heat exchange the possible.

▲ top This object becomes 1 dissolved by the features of the claim. Convenient embodiments of the invention result from the features of the claims 2 to 12.

In accordance with condition of the invention an heat exchanger is provided, which consists of open-porous metal foam and at least an heat spreader, which are material-conclusively tied up to the metal foam, whereby those is the metal foam remote surface of the heat spreader structured.

The material-conclusively tied up heat spreader makes a large area available for the heat transfer on the open-porous metal foam, without impairing the heat transfer. The structuring of the surface of the heat spreader, which is the metal foam remote, leads to an enlargement of this surface of the heat spreader, so that warm one becomes more efficient passed into the metal foam. By the structuring of the surface reduced itself in addition the weight of the heat spreader and thus the heat exchanger altogether. The heat exchanger is besides compact designed.

The geometric shape of the heat exchanger is very variable, the metal foam can in one for the respective application purpose of suitable shape manufactured become. The heat exchanger can exhibit right parallelepiped, cube, tubular or comblike shape. In addition the heat exchanger can exhibit several segments.

Preferably the surface of the heat spreader is in such a manner structured that channel shaped structures on the surface of the heat spreader are formed. By these channel-like structures for example a liquid medium can become guided. Into the channel shaped structures on the surface of the heat exchanger however also tubes, for example through solders, can become presses or sticking introduced.

The heat spreader is appropriately formed as plate or bar. The term "bar" is to be understood in this connection as element with comparatively small surface, only a small portion of the metal foam surface covered. The surface of such a bar can exhibit for example a structuring in form of an individual channel. The metal foam exhibits appropriately several such bars. The term "plate" is to point out that the heat spreader a larger part of the surface or an entire outer surface of the metal foam covered, whereby the surface of the heat spreader can exhibit more complicated structures. The heat spreader can consist several plates of several bars, several plates or a combination of or and or several bars.

The heat spreader consists convenient of metal, which is essentially nonporous, D. h. made of so called "full metal". Suitable metals for this purpose are for example aluminium, copper or steel. The metal foam should be from aluminium formed. The structuring of the surface of the manifold can become by mechanical or similar abrasive methods of handling for example using a laser made.

The structuring in the bars and plates can go in the geometric design the far beyond possibilities, which are to be obtained with tubes. Bending radiuses represent thus no more restriction. The branching of the structure in the surface of the heat spreader can take place very fine and three-dimensional. A still finer structuring can become achieved, as become introduced into the already formed contours coatings. The laminar utilization for the warm exchange came by it optimized becomes.

The heat spreader can be further with a cover layer connected, those the structured surface of the heat spreader covered. The cover element can be as simple plate performed. Alternative one can exhibit those the heat spreader zugewandete surface of the cover layer to the structures in the surface of the heat spreader mirror-image structure. It is however also possible that those exhibits the heat spreader zugewandete surface of the cover layer a finer structure than the warm distributor. This finer structuring can be present within the essentially mirror-image pronounced structure of the cover layer.

The cover layer consists appropriately of the same material as the heat spreader. The connection of the cover layer with the heat spreader can be for example by soldering or sticking together manufactured.

Subsequent ones become embodiments of the invention on the basis the designs more near explained. Show:

Fig. 1 an heat exchanger from open-porous metal foam with two heat spreaders;

Fig. 2 an heat exchanger with strong structured warm distributor surface;

Fig. 3 an heat exchanger with structures in the warm distributor surface, are embedded into which tubes;

Fig. 4 an heat exchanger with a plate shaped heat spreader, is applied on which a plate shaped cover layer;

Fig. 5 an heat exchanger with a plate shaped heat spreader, is applied on which a cover layer with structured surface; and

Fig. 6 an heat exchanger with segmented metal foam.

In Fig. 1 heat exchangers shown consists of the open-porous metal foam 1, to which an heat spreader 2 is material-conclusively cast-on. The heat spreader consists of a bar 2,2 and a plate 2.3. Bar 2,2 and plate 2,3 exhibit channel-like recesses, which form the structuring 3.

▲ top

By the structure 3 a suitable fluid medium (arrows) in the countercurrent principle flows.

In Fig. a more complex structuring 3 exhibits 2 represented heat exchangers, which is mA other-like performed.

In Fig. 3 is tubes 5 shown, which are into the structures in the surface of the heat spreader 2 embedded. The tubes 5 are flowed through of suitable fluid medium (arrows).

Fig. 4 shows an heat exchanger, whose channel-like structured warm distributor surface of a plate shaped, unstructured cover layer is 4 covered.

Fig. 5 shows an heat exchanger, whose channel-like structured warm distributor surface of a cover layer is 4 covered. The cover view 4 exhibits a structuring 5, which is mirror-image 4 formed to the structuring 3 of the heat spreader 2 at that the heat spreader 2 facing surface of the cover layer.

Fig. 6 shows an heat exchanger with segmented metal foam 1. The metal foam 1 is flowed through by a fluid medium A (arrow A), while another fluid medium B (arrow B) flows by the channel-like structure 3 of the warm distributor 2. If medium B is the medium with the higher temperature, becomes its warm one 1 passed by the heat spreader 3 into the metal foam, where she is delivered by the fluid medium A received and from the heat exchanger. The fluid medium A can become for example by a fan (not shown) moved.

In particular regarding the cooling of electronic components is provided that a fan for a forced convection is in the metal foam 1 introduced; this umschlossene construction is paired with a lasting noise insulation.

Besides the surface of the metal foam can be 1 with nanoparticles coated, in order to reach a surface enlargement and/or to avoid a contamination of the metal foam due to the Lotuseffektes.

List of the used reference numerals
1 metal foam
2 heat spreaders
2,1 plate
2,2 bar
3 structure and/or. Structuring of the heat spreader
4 cover layer
5 structure and/or. Structuring of the cover layer
A fluid A
B fluid B

▲ top

Europäisches Patentamt
European Patent Office
Office européen des brevets

Claims of DE10207671	Print	Copy	Contact Us	Close

Result Page

1. Heat exchanger, existing from open-porous metal foam (1) and at least an heat spreader (2), which are material-conclusively tied up to the metal foam (1), whereby those is the metal foam (1) remote surface of the heat spreader (2) structured.

2. Heat exchanger according to claim 1, characterised in that the surface of the heat spreader (2) in such a manner structured is that channel shaped structures (3) on the surface of the heat spreader (2) are formed.

3. Heat exchangers after one of the managing claims, characterised in that into the structures (of 3) tubes (5), formed on the surface of the heat spreader (2), introduced are.

4. Heat exchangers according to claim 3, characterised in that the tubes (5) soldered into the structures (3) on the surface of the heat spreader (2), pressed or bonded are.

5. Heat exchanger after one of the managing claims, characterised in that of the heat spreaders (2) as plate (2.1) or as bar (2.2) formed is.

6. Heat exchanger after one of the managing claims, characterised in that of the heat spreaders (2) of full metal consists.

7. Heat exchanger after one of the managing claims, characterised in that the metal foam (1) of aluminium consists.

▲ top 8. Heat exchanger after one of the managing claims, characterised in that of the heat spreaders (2) of aluminium, copper or steel consists.

9. Heat exchanger after one of the managing claims, characterised in that of the heat spreaders (2) with a cover layer (4) connected is.

10. Warm diver according to claim 9, characterised in that those the heat spreader (2) facing surface of the cover layer (4) one to the structures (3) in the surface of the heat spreader (2) mirror-image structure (6) exhibits.

11. Heat exchanger according to claim 9 or 10, characterised in that the cover layer (4) a finer structuring (6) than the heat spreader (2) exhibits.

12. Heat exchanger after one of the claims 9 to 11, characterised in that the cover layer (4) of the same material as the heat spreader (2) consists.

13. Heat exchangers after one of the managing claims, characterised in that the structures (3, 6) in the surface of the heat spreader (2) and/or the cover layer (4) by coatings refined are.

14. Heat exchanger after one of the managing claims, characterised in that the metal foam (1) a fan for a forced convection encloses.

15. Heat exchanger after one of the managing claims, characterised in that the surface of the metal foam (1) with nanoparticles coated is.